Community College of Philadelphia

Academic Program Audit: Mathematics Curriculum

Mathematics Department

Division of Math, Science and Health Careers

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I. Executive Summary

The mathematics (math) program at Community College of Philadelphia (CCP) offers a comprehensive core mathematics curriculum that prepares students to transfer to a baccalaureate institution to study mathematics. The program was created in 1999 and is housed in the Math Department. The mathematics curriculum consists of seven advanced math courses, along with other required courses in other disciplines. The 30-35 sections of these seven math courses that are offered each year constitute a small number of the over 600 sections of math courses offered by the Math Department each year. However, these seven courses also support other disciplines in the College.

Several revisions have been made to the curriculum since it was created in 1999, reflecting a strong commitment to keeping the program current and responsive both to the needs of students and the expectations of transfer institutions. Recent curricular revisions have been made to incorporate the new College-wide general education requirements, and program level student learning outcomes have been developed.

The program is operated in a cost effective manner. Program costs are lower than the College average.

Recommendations from this audit focus on enrollment management, student support, outcomes and assessment, course documentation, and facilities and equipment.

II. Curriculum

Major goals of the program
The goals of the mathematics program are to give students a solid grounding in college level courses and prepare them for transfer to baccalaureate institutions where they will pursue a Bachelor’s degree in mathematics. As described in the 1999 Math Curriculum Proposal, the program provides freshman and sophomore level courses in both discrete math and continuous math, leading to an A.S. degree in mathematics that is transferable to baccalaureate programs in mathematics. The program gives students a working knowledge of the field and in particular:

- Develops skills in calculation, both with and without calculating devices
- Explores the fundamentals of general mathematical structures
- Teaches the basic methods and theory of mathematical analysis
- Enables students to understand and create mathematical arguments and proofs
- Teaches formal abstractions leading to more advanced areas of mathematics.

In addition, the mathematics program has the following student learning outcomes. Upon completion of this program graduates will be able to:

- Communicate mathematical ideas.
- Construct mathematical proofs.
Analyze and solve mathematical problems.
Construct recursive procedures to perform complex tasks.
Learn and apply algorithms.
Transfer courses to a baccalaureate program in math or science.

The mathematics program is housed in the Division of Mathematics, Science and Health Careers.

History of the Program
The mathematics curriculum was created in 1999 through a faculty committee consisting of members of the Mathematics Department. It was not necessary to create additional courses for the curriculum because the core math courses required by the curriculum were also required by either the computer science or engineering program or both, and already existed. These core math courses are standard math courses required by most math programs at baccalaureate institutions.

Previously, CCP students intending to pursue a career in math were taking these courses, but were either graduating from CCP with a more general degree or were transferring without graduating.

Description of the curriculum
The required math courses in the curriculum are three semesters of calculus, two semesters of discrete math, and one semester each of linear algebra and differential equations. Students also take two semesters of computer programming and three semesters of lab science. Students are encouraged but not required to take calculus-based physics for their lab science.

General education courses required are English Composition 101 and 102, CIS 103: Applied Computer Technology, a social science elective, and a humanities elective. All general education requirements are met through required courses (as indicated above) except for the Writing Intensive requirement, the Interpretive Studies requirement and the American/Global Diversity requirement. Therefore, in order to graduate, students in this program must choose one course that is designated Writing Intensive, one course that is designated Interpretive Studies and one course that is designated American/Global Diversity. The same course may be used to fulfill more than one of these requirements.
## Associate in Science in Mathematics
### Sequence of Courses

<table>
<thead>
<tr>
<th>Course Number and Name</th>
<th>Prerequisites and Corequisites</th>
<th>Credits</th>
<th>Gen Ed Req.</th>
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<tr>
<td><strong>FIRST SEMESTER</strong></td>
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<tr>
<td>MATH 171 – Calculus I</td>
<td>MATH 162</td>
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<td>ENGL 101 – English Composition I</td>
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<td>MATH 163 – Discrete Math I</td>
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<tr>
<td>Lab Science Elective</td>
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<td>4</td>
<td>Natural Science</td>
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<tr>
<td><strong>SECOND SEMESTER</strong></td>
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<td></td>
</tr>
<tr>
<td>MATH 172 – Calculus II</td>
<td>MATH 171</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 263 – Discrete Math II</td>
<td>MATH 163</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ENGL 102 – English Composition II</td>
<td>ENGL 101</td>
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<td>Engl. 102, Info Lit.</td>
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<td>Lab Science Elective</td>
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<td>4</td>
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<tr>
<td><strong>THIRD SEMESTER</strong></td>
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<td></td>
<td></td>
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<tr>
<td>MATH 270 – Linear Algebra</td>
<td>MATH 171,172</td>
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<tr>
<td>CSCI 111 – Programming and Algorithm Development I</td>
<td>MATH 161</td>
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<td>CIS 103 – Applied Computer Technology</td>
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<td>Lab Science Elective</td>
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<td><strong>FOURTH SEMESTER</strong></td>
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<td>MATH 271 – Calculus III</td>
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<td>CSCI 112 – Programming and Algorithm Development II</td>
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<td>Social Science Elective</td>
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<tr>
<td>MATH 272 – Differential Equations</td>
<td>MATH 172,270</td>
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<td></td>
</tr>
<tr>
<td><strong>MINIMUM CREDITS NEEDED TO GRADUATE</strong></td>
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<td>63</td>
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</tbody>
</table>

The mathematics program is open to interested students who have demonstrated readiness for English 101 and Math 171, either by the appropriate placement or by meeting the prerequisites for the course.

**Internal program coherence**
The curriculum provides a foundation in three distinct areas: calculus, discrete math, and general education. The core sequence of math courses includes three semesters of calculus (Math 171/172/271) as well as two courses that require knowledge of calculus, Math 270: Linear Algebra and Math 272: Differential Equations. Math 271: Calculus III and Math 272: Differential Equations both require knowledge of Math 270: Linear Algebra. The usual sequence is Math 171, 172, 270, 271/272, as shown in the table above.

Each course in the sequence builds on the knowledge of the previous course. The development of calculus as a subject was originally motivated in large part by problems in physics. Students are therefore encouraged to take calculus-based Physics 140:
Mechanics, Heat, and Sound; Physics 241: Electricity, Magnetism, and Light; and Physics 242: Modern Physics to fulfill their lab science requirement.

The curriculum also includes a two-semester discrete math sequence, Math 163/263. Discrete math has applications in computer programming and the topics fit nicely with the required computer programming course sequence CSCI 111/112: Programming and Algorithm Development I and II. The discrete math sequence also helps prepare students for more advanced math courses they may take after transferring by reinforcing the language of mathematical proof.

Revisions Since Inception of the Curriculum
The curriculum was revised in 2005 by a full-time faculty committee of the Math Department. Four changes were made to the curriculum.

1. Prerequisites of Math 271: Calculus III were changed to include Math 270: Linear Algebra. This change enabled Calculus III classes to use concepts from linear algebra in the study of multivariate calculus. (For example, in Calculus III, problems deal with sets that are curved, and students need to find flat approximations, which is something they would learn in Linear Algebra.) Courses in the curriculum were re-sequenced to accommodate this change.

2. A new course Math 263: Discrete Math II was added to the curriculum. This course was requested by the computer science program but was not made a required course for the computer science program. However, it was believed to be beneficial for math students because of the increased importance of discrete math in the digital age. To accommodate this new course, one of the humanities electives was dropped. This resulted in a net increase in the total number of credits required for graduation in the math curriculum from 62 credits to 63 credits.

3. Math 251: Statistics for Science was removed as an optional course because it is not calculus-based and generally baccalaureate math programs require calculus-based statistics. Previously students in the CCP math curriculum had the option of taking either Math 251: Statistics for Science or Math 272: Differential Equations. This latter course is a standard course in baccalaureate math programs.

4. All science course requirements were designated as lab science requirements.

In 2009, the curriculum was revised to comply with the new general education requirements for the 2010-2011 academic year. Specifically, one social science elective was replaced with CIS 103 in order to comply with the new technological competency general education requirement. (See Appendix A)

There is not currently a complete set of course documents on file for all of the courses in the mathematics curriculum. Math 171: Calculus I and Math 172: Calculus II do not currently have course documents on file. Math 263: Discrete Math II does not have an Act 335 course evaluation on file. The other courses in the curriculum have course documents on file and are in compliance with course evaluations that state that the courses meet the Act 335 requirements.
Curricular Updates
In 2007, the Math Department created a math curriculum committee for the purpose of creating new courses, updating old courses, communicating with other departments, and making recommendations on pedagogy. The current committee consists of six full time faculty members and one part-time faculty member. The math curriculum committee was active from Fall 2007 through Spring 2009. A major project of its first year was the development of a set of prerequisite tests for a number of courses including Math 163, 171, 172, and 271. The tests were designed to be given the first day of class to give both the students and the instructors an idea of the extent to which the students actually knew the prerequisite knowledge for the course. (To date, there is no data available showing the results of these prerequisite tests.)

Starting in Summer 2005, Math 171: Calculus I has been offered on-line each semester, and starting in Summer 2006 Math 172: Calculus II has been offered on-line each semester.

In 2008, in order to comply with a new College-wide requirement, the department approved the following measurable program-level student learning outcomes for inclusion in the 2009/2010 catalog.

Upon completion of the program, students will be able to:
• Learn and apply algorithms.
• Construct mathematical proofs.
• Communicate mathematical ideas.
• Construct recursive procedures to perform complex tasks.
• Analyze and solve mathematical problems.
• Transfer courses to a baccalaureate program in math or science.

Assessment measures for these outcomes need to be created.

Some instructors have introduced technology such as Maple software (a very sophisticated mathematical software program) in their courses, including math courses which have not normally required the use of technology. These instructors take their classes to the computer lab for several class sessions to familiarize them with the capabilities of the software, which is incorporated into the math courses at some transfer institutions.

Departmental Organizational Changes
There is a position of math curriculum supervisor paid at the rate of 1 credit hour of extended time (45 clock hours) per semester. The duties of this position include promoting the math curriculum, outreach to students and prospective students, advising students on courses at CCP and on transfer and career possibilities, participating in and responding to directions from the math curriculum committee, and making proposals about any changes to the math curriculum. Three full time faculty members have held the position of math curriculum supervisor since 1999.
Anticipated Revisions and Challenges
In 2008, the College required for the first time that each program have a list of measurable student learning outcomes for the 2009/2010 catalog and an assessment plan. The outcomes for the math curriculum are listed under Curricular Updates above. A project for 2010-2011 is to develop and implement assessment measures for these program learning outcomes. Also in the 2009-2010 academic year, program faculty were required to develop learning outcomes for each course.

Relationship to College Mission and Strategic Plan
The mathematics program directly addresses the College’s mission of providing “a coherent foundation for college transfer, employment, and life-long learning” and by helping “all students to achieve:

- Heightened curiosity and active interest in intellectual questions and social issues;
- Improved ability to pursue paths of inquiry, to interpret and evaluate what is discovered, and to express reactions effectively;
- Self-fulfillment based on service to others, preparation for future work and study, and enjoyment of present challenges and accomplishments”

Earning an associate degree, transferring to a baccalaureate institution, preparing for employment, meeting the changing needs of business, industry, and the professions, gaining an active interest in intellectual questions and the ability to pursue paths of inquiry are all program goals and also part of the college mission.

Relationship to Other Programs at the College
Math is used in a number of different fields. Many of the core math courses in the program are also required for the engineering science and computer science curricula at Community College of Philadelphia. In fact, some students graduate with dual degrees in math and engineering or math and computer science by taking a few extra courses. Some business majors intending to transfer also take the calculus sequence.

An issue that needs to be investigated further is the availability of tutoring for students in the math program courses. Program faculty have expressed that students in the program would benefit from greater availability of tutors. The lack of availability of tutors has been especially noted at the regional centers but has also been the case for certain courses on main campus. The investigation should identify if there is a need for additional tutors for all math courses, certain specific courses, and/or any of the courses in the curriculum.
III. Faculty

Profile of the Faculty
There are approximately 30 full-time faculty members, 6 full-time visiting lecturers, and 80 part-time faculty members in the Math Department, typically teaching about 270 sections per semester. However, only about 12 to 15 of these sections each semester are core courses for the math degree. In these sections, there are only four to five math majors. The other students typically major in engineering, business, or computer science. Of the remaining sections, about 130 are developmental, 70 are intermediate algebra which is accepted for college credit at some colleges, and 50 are college level for non-majors. Thus, typically half of the load of a full-time faculty member is developmental. Furthermore, in any given semester fewer than half of the faculty are teaching program core courses.

Faculty Qualifications and Expertise
Full-time faculty members typically have either a master's degree or Ph.D. in math. Fourteen of the 30 full-time faculty members have Ph.D.s: twelve in math, one in math education, and one in physics. With one exception, the remaining full-time faculty members all hold a master’s degree or have completed all of the degree requirements for a master’s degree. Ten of these full-time faculty members teach the courses in the curriculum each year, and an additional four to five teach the curriculum courses occasionally. Faculty with a Master's degree in math typically have taken at least 15 math courses beyond what is offered at CCP. This depth of knowledge in math is helpful in writing and revising courses, responding to student questions that go beyond the scope of the course, providing students with a context for particular topics, and giving students a sense of what lies ahead should they continue their studies in math.

One faculty member was invited by both the American Mathematical Society to serve as a reviewer for the Journal of Mathematical Reviews and also by the University of Delhi, India to act as an examiner of a dissertation for a doctoral candidate at the university whose work is related to his own. Mathematical Reviews is a database of over 2.4 million reviews of mathematics publications and is the leading publication of the American Mathematical Society. In addition, this professor recently published the article “Normal Structure and the Generalized James and Zbaganu Constants” with a co-author in the October 2009 issue of the Journal of Nonlinear Analysis.

A member of the math faculty won the Christian R. and Mary Lindback Distinguished Teaching Award in 2000-2001.

Faculty Support of Curriculum
Faculty report that they support the curriculum by encouraging their students to choose the curriculum, by revising courses, and by revising the curriculum. Faculty also give their time to the CCP Math Club/CCP Mu Alpha Theta Math Honor Society, the annual math contest for high school students, and by financially supporting the Math Department Award for transferring students.
Professional Development
Several faculty members subscribe to journals and attend professional meetings. At least one faculty member is a regular contributor to mathematical journals. Faculty have attended CCP in-service workshops focusing on mathematical content, as well as workshops and meetings on pedagogy.

With respect to math pedagogy, in 2008 there were at least six open meetings and workshops on teaching developmental math. Approximately 30 Math Department faculty members attended at least one of these meetings. Some of the ideas from these meetings could also be applied to college-level math. There have also been a number of department-wide discussions on pedagogy through email. At least some Math Department faculty have also participated in pedagogy workshops and courses (not specific to math) provided by the College. A few faculty members also participate in peer classroom observation, as indicated in the departmental evaluation plan.

Although not all of the faculty in the Math department participate in professional development or department-sponsored events and activities such as constructing tests and classroom observation, the faculty who teach in the curriculum are among the most active and engaged faculty members in the Department.

Contributions to the Life of the Department and the College
The Math Awards Committee administers the Tom Scott Award and the Math Department Award. The Tom Scott Award is funded by the estate of the late Tom Scott, a former Math Department faculty member who died in 1981. The Math Department Award was established in 1999 and is funded by donations from faculty. Both awards are $500 and are for students who have taken calculus and are transferring from CCP to baccalaureate institutions in math or a related area. (See Appendix B) Currently, three previous award winners are teaching math at CCP-- one as a full time faculty member, and two as visiting lecturers.

In addition to the open meetings, pedagogical discussions also have taken place within various committees of the Math Department such as the Committee on Elementary Education and its Effects on the Curriculum, pre-calculus committee, hiring committee, curriculum committee, and textbook selection committees.

The Math Club has been active since 2005 and is geared toward students taking pre-calculus or courses requiring pre-calculus. The club has three faculty advisors. Level of participation has varied from year to year, with student attendance at meetings ranging from 1 to 17. At a typical monthly Math Club meeting, a faculty member or student may make a presentation on a topic of interest in mathematics, or the group may practice for or participate in the Rocket City math contests. (See Appendix C)

CCP has a local chapter of the national Math Honor Society Mu Alpha Theta. Three full-time faculty members serve as sponsors. Students are eligible to join Mu Alpha Theta if
they have participated in at least three meetings or events of the Math Club, have completed Math 162 or a course requiring Math 162 at CCP, have at least a B average in their math courses at the Math 161 level or higher, and pay $5 for the certificate. Typically, a few members of the Math Club join Mu Alpha Theta each year. (See Appendix C)

The department also sponsors an annual math competition for high school students. This highly successful event has grown in recent years, and in 2009 it involved 135 high school students from eleven Philadelphia public and charter high schools. The day-long event includes a morning session in which the high school students solve challenging math problems individually, and an afternoon team problem-solving competition. Current CCP math students are invited to help run the competition.

The Math Department has been participating in the College’s Achieving the Dream initiative, and the department chair serves as a member of the Achieving the Dream core team.

The department has an extensive web site with a great deal of information about courses, the curriculum, and co-curricular activities, which can be viewed at http://faculty.ccp.edu/dept/math

IV. Facilities and Equipment

How Well Current Facilities Support Program Needs
Courses are typically taught in classrooms with a seating capacity of 36 students and with chalkboards or whiteboards. A few sections are scheduled one or more days per week in a classroom equipped with computers. Instructors whose classes are originally scheduled for a regular classroom have the option of relocating to a classroom with computers for one or more sessions as needed.

What Future Needs Can Be Identified
Faculty have expressed a need for the following improvements in facilities:

1) Additional chalkboard space: Faculty have expressed that the limited amount of chalkboard space available in some classrooms is an obstacle to effective mathematics teaching. Additional chalkboard space would be useful in the following ways:
   (a) demonstrating a long mathematical procedure with many steps.
   (b) providing space for results or formulas to be referred to throughout a presentation.
   (c) providing space for an entire class to work problems at the board. Sending an entire class to the board creates a very different and more interactive classroom dynamic than sending a few students to the board at a time. It breaks up the monotony of a long class, especially the 80-minute and 170-minute classes. This procedure works best in classes with 20 or fewer students and chalkboards covering 3 or 4 walls.
It should be noted that the faculty prefer chalkboards to whiteboards.

2) A dedicated computer lab and server: Mathematics departments at other colleges and universities typically have computer labs that complement the “standard issue” desktops and shared IT infrastructure. The Mathematics Department at CCP has proposed that a specialized computer infrastructure that differs from the standard typically used at Community College of Philadelphia be created to allow for specific types of endeavors that can best be performed through the Linux configuration. The Linux operating system, as opposed to a Windows environment, better supports many software applications typically used by mathematicians (e.g. TeX for document preparation, R for statistical and mathematical computing and graphing/data display). The usual operating system supported by IT does not meet an important subset of mathematicians’ needs.

Another reason mathematics departments often have a departmental computer is that mathematical computation has a different resource-usage profile from other computational needs. Mathematical computation tends to be long duration single processes, as opposed to many short duration processes, as experienced by a database or web server. Moreover, mathematics software often requires very large amounts of memory to be available in large contiguous blocks to a single process. As a result the hardware of standard IT isn’t well suited to mathematical computing. A separate machine, with lots of RAM available to a single process (typically 64 bit in order to increase the possible process address space), is usually the simplest solution. Finally, mathematicians sometimes wish to develop applications for their students to use to illustrate concepts from classes.

The multiple benefits that would be derived from a dedicated computer lab for the math program, as well as the technological and computational needs of the department, are detailed in a proposal written by the math faculty in December 2006 and a supporting memorandum from the Dean of the Division of Math, Science, and Health Careers dated January 2007, which appear in Appendix E. Issues relating to this proposal include budget, system security, maintenance of the technology, and availability of space.

Some of the objectives and needs for the dedicated server can be met by having Maple T.A. platform software available to the math program faculty. This software enables faculty to create files of on-line homework problems, create and administer tests and develop a test bank, and engage in data gathering functions such as grade book and test item analysis. The Math Department obtained a pilot license for Maple TA that is valid from June to December 2010.

3) More timely updates of software used by the department: There was a significant lag time between the time the department requested that TeX publishing software be installed on its computers and the actual installation (the exact timeframe is not documented.) The Maple software should be updated at least every three years (a new version is generally published every year) to be able to take advantage of new functionality and to be current with transfer institutions. Typically, faculty members give assignments in Maple software
in the upper level classes. As mentioned above, the math program did just obtain the latest version of Maple software (Maple 14.)

How Facility Utilization Impacts Other Areas of the College
College-wide, it appears that most classrooms are able to accommodate 36 students, as that is the maximum class size for many classes including college-level math classes. Most classrooms are used by many different departments, and daytime weekday classroom space is at a premium. This affects the scheduling of additional sections as sections fill. Math faculty also share with other departments the scheduling of sessions in a computer classroom, use of the library, and use of the Learning Lab. However, aside from not having enough tutors (as mentioned above), these facilities seem to have adequate availability.

V. Outcomes and Assessment

The math program has developed student learning outcomes for the program, which state that upon completion of the program, graduates will be able to:

- Communicate mathematical ideas.
- Construct mathematical proofs.
- Analyze and solve mathematical problems.
- Construct recursive procedures to perform complex tasks.
- Learn and apply algorithms.
- Transfer courses to a baccalaureate program in math or science.

During the 2009-2010 academic year, the development of course level student learning outcomes was required for each course in the mathematics curriculum. In the 2010-2011 academic year, assessment measures will be developed and implemented to measure student attainment of the course-level and program-level learning outcomes.

Graduates
Since its inception in 1999, the curriculum has graduated 43 students. On average, the program has graduated 4 students a year over the past 10 years. While it has always been a small program, over the past five years there has been a decrease in the number of graduates per year, for a five-year average of 2.2 graduates.

The following table shows the number of degrees awarded from 2000 through 2010.

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<th>Number of program graduates</th>
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<td>2000</td>
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Student Profile

The credit headcount for the curriculum has remained fairly stable over the last five years, with an increase in the Spring 2006 semester and a noticeable drop in the Spring 2007 semester. While there were some semesters in the last five years in which the gender balance was nearly even, in recent semesters there has been a marked decrease in female students. The students represent a diverse racial mix, with African-Americans comprising the largest percentage. The age-group most represented in the program is the 22-29 year old group.

Credit Headcount

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<th></th>
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<th>Spring 2006</th>
<th>Fall 2006</th>
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Credit FTE headcount

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Program Enrollment by Gender as Compared to College-wide Enrollment (Percent)

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Program Enrollment by Racial/Ethnic Background

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Program Enrollment by Racial/Ethnic Background as Compared to College-Wide Distribution (percent)

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Enrollment by Age as Compared to College-wide Enrollment (Percent)

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The following table shows that there is fluctuation in the percentage of students in the program who are full-time or part-time, but most semesters about half to three-quarters of the students are part-time students.

Program Full-time/Part-Time Enrollments as Compared to College-wide Enrollments (Percent)

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13
It is notable that none of the students in the math program tested at an all-developmental level when they entered the College, compared to approximately one-third of the college population as a whole. Similarly, many more math students entered the College with college-ready math and English skills than did students College-wide.

Developmental Status at Entry Program Students as Compared to College-Wide Enrollment (Percent)

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Retention Data
Persistence rates for returning to the same program Fall to Spring and Fall to Fall, with the exception of Fall 2006 to Spring 2007, are greater than the College-wide rates. In general, math students who return to a different program in the subsequent Spring semester do so at about the same rate as the students across all programs at the College (4.7% for the program versus 4.4% for the College overall over the last five years.)

Students who returned to the Same Program or a different program in the subsequent Spring Semester (Percentage)

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Students who returned to the Same Program or a different program in the subsequent Fall Semester (Percentage)

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<tr>
<td>Program</td>
<td>38.5</td>
<td>66.7</td>
<td>33.3</td>
<td>45.5</td>
</tr>
<tr>
<td>College</td>
<td>49.1</td>
<td>48.3</td>
<td>48.8</td>
<td>46.1</td>
</tr>
</tbody>
</table>

Academic Performance

Course completion rates, while consistently high, have been higher than the College rate for five out of the last nine semesters. As shown in the table below, average GPA of students in the mathematics program has consistently been higher than the College-wide average GPA.

Course Completion and Average GPA

<table>
<thead>
<tr>
<th></th>
<th>Fall 2005</th>
<th>Spring 2006</th>
<th>Fall 2006</th>
<th>Spring 2007</th>
<th>Fall 2007</th>
<th>Spring 2008</th>
<th>Fall 2008</th>
<th>Spring 2009</th>
<th>Fall 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of college-level credits</td>
<td>91.7</td>
<td>85.9</td>
<td>92.9</td>
<td>81.7</td>
<td>83.3</td>
<td>91.7</td>
<td>95.0</td>
<td>100</td>
<td>86.2</td>
</tr>
<tr>
<td>attempted/ completed—Math</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program</td>
<td>88.2</td>
<td>88.8</td>
<td>88.5</td>
<td>86.8</td>
<td>88.1</td>
<td>87.0</td>
<td>88.4</td>
<td>87.9</td>
<td>88.4</td>
</tr>
<tr>
<td>% of college-level credits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>attempted/ completed—College-wide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average GPA—Math Program</td>
<td>2.74</td>
<td>3.01</td>
<td>3.07</td>
<td>2.71</td>
<td>2.89</td>
<td>2.65</td>
<td>2.82</td>
<td>3.11</td>
<td>N/A</td>
</tr>
<tr>
<td>Average GPA—College-wide</td>
<td>2.60</td>
<td>2.63</td>
<td>2.61</td>
<td>2.58</td>
<td>2.63</td>
<td>2.60</td>
<td>2.63</td>
<td>2.63</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Academic Standing (percent)

<table>
<thead>
<tr>
<th></th>
<th>Fall 2005</th>
<th>Spring 2006</th>
<th>Fall 2006</th>
<th>Spring 2007</th>
<th>Fall 2007</th>
<th>Spring 2008</th>
<th>Fall 2008</th>
<th>Spring 2009</th>
<th>Fall 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Standing</td>
<td>92.3</td>
<td>94.1</td>
<td>93.3</td>
<td>88.9</td>
<td>50.0</td>
<td>76.9</td>
<td>81.8</td>
<td>76.9</td>
<td>92.3</td>
</tr>
<tr>
<td>Dropped insufficient</td>
<td>7.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8.3</td>
<td>15.4</td>
<td>0</td>
<td>7.7</td>
<td>0</td>
</tr>
<tr>
<td>progress/poor scholarship</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probation - FT/PT/Prov.</td>
<td>0</td>
<td>5.9</td>
<td>6.7</td>
<td>11.1</td>
<td>41.7</td>
<td>7.7</td>
<td>18.2</td>
<td>15.4</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Success at departure (percent)

<table>
<thead>
<tr>
<th>Status</th>
<th>Fall 2005</th>
<th>Spring 2006</th>
<th>Fall 2006</th>
<th>Spring 2007</th>
<th>Fall 2007</th>
<th>Spring 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduated</td>
<td>0</td>
<td>18.2</td>
<td>0</td>
<td>16.7</td>
<td>50</td>
<td>16.7</td>
</tr>
<tr>
<td>Long term success</td>
<td>100</td>
<td>27.3</td>
<td>44.4</td>
<td>50</td>
<td>0</td>
<td>50.0</td>
</tr>
<tr>
<td>Short term success</td>
<td>0</td>
<td>36.4</td>
<td>44.4</td>
<td>16.7</td>
<td>0</td>
<td>16.7</td>
</tr>
<tr>
<td>Unsuccessful</td>
<td>0</td>
<td>18.2</td>
<td>11.1</td>
<td>16.7</td>
<td>50</td>
<td>16.7</td>
</tr>
</tbody>
</table>

- Long term success is defined as departure with a GPA of 2.0 or greater and 12 or more cumulative hours earned
- Short Term success is defined as departure with GPA of 2.0 or greater with 11 or fewer cumulative hours earned.
- Unsuccessful is defined as all departing students not otherwise classified including students who never completed a college-level course.

Transfer Data

Transfer data is only available for 2007 and 2008.

Percentage of Mathematics Students who Transfer shortly after Graduating from the College

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=1</td>
<td>n=2*</td>
</tr>
<tr>
<td>100.0%</td>
<td>50.0%</td>
<td></td>
</tr>
</tbody>
</table>

Percent of Students who Felt Their CCP Preparation for Transfer was either Excellent or Good

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=1</td>
<td></td>
</tr>
<tr>
<td>100.0%</td>
<td></td>
<td>No respondents</td>
</tr>
</tbody>
</table>

*This is the number of students who responded to the graduate survey sent out by the Office of Institutional Research. There were four math graduates in 2007, and three in 2008.
Student Survey results
Surveys were mailed and/or emailed to current, former, and graduated students in the mathematics, engineering, and computer sciences program. Students from these programs constitute the majority of students who take the courses in the math curriculum. Surveys were also distributed in math classes during the Spring 2010 semester. Surveys were sent to:

- 14 current mathematics students
- 42 mathematics graduates
- 65 former mathematics students
- 52 current computer science students
- 95 computer science graduates
- 335 former computer science students
- 83 current engineering science students
- 73 engineering science graduates
- 309 former engineering science students

From the surveys sent out and distributed in class, a total of 30 surveys were returned, including six from math majors. The returned surveys are from:

- 4 mathematics graduates
- 1 former mathematics student
- 1 current mathematics major
- 7 current engineering science majors
- 2 current CST majors
- 4 current computer science majors
- 3 current business majors
- 1 current biology major (student who listed biology as their major)
- 1 current engineering science major
- 1 dual mathematics and computer science major
- 1 current architecture student
- 2 current science students
- 2 current students who did not indicate their program of study

Copies of the surveys and the tallied results can be found in Appendix F. The survey return rate was 2.8%, and therefore caution should be used in interpreting the data.

Twenty-five current students returned surveys. Of those, eight students felt that the preparation they are receiving for transferring to another college or obtaining a job in their desired field was excellent, twelve felt the preparation was good, four felt the preparation was fair, and one felt it was not helpful. Nineteen of the current students indicated that they are satisfied with the instruction they are receiving in the mathematics program, while five said they were not satisfied. Fifteen students said they were satisfied with the support they received from the faculty, and three said they were not satisfied with the support they received from the faculty. Current students cited the help they received from the faculty, tutoring workshops, and “selected” outstanding professors as the strengths of the program. Two students cited a need for more interactive class
sessions, awareness of different learning styles, Math 118 not preparing students for future classes, and a need for more “solid” professors as areas for improvement.

All four of the mathematics graduates who responded to the survey transferred to baccalaureate institutions upon completion of the math curriculum at CCP. Of these, one said the preparation they received for transferring to another college was excellent, one said it was good, one said it was not helpful, and one did not respond to this question.

In response to the question “Did you accomplish the educational objectives that you set for yourself at Community College of Philadelphia?” one student responded that (s)he had fully accomplished the educational objectives, two students said that they had partially accomplished the educational objectives, and one student said (s)he did not accomplish the educational objectives.

Two of the graduates were satisfied with the instruction they received, and one was not, and the same was true for the support they received from the faculty.

Strengths of the program cited by graduates were excellent full-time faculty compared to other community colleges, well-organized high–level courses, and strong interactions between math courses and the Learning Lab. Areas for change and improvement stated were: offering more advanced math courses, offering more advanced math courses during the summer, better math software tools, books with better explanations, more hands-on education, education in Mathlab and Mathematica, and better test conditions.

Looking at the aggregate of returned surveys, several respondents said that the professors rush through the material. One faculty member consistently received negative comments on the student surveys in regards to being disrespectful to students and having a hostile classroom environment. Other concerns about faculty related to a need for some faculty to improve their teaching methods. Students also expressed concern about cheating among students.

VI. Demand and Need for the program

Typically, at any given time, about 10 students are enrolled in the mathematics degree program, not including students with dual majors and whose primary major is in another department. Since its inception in 1999, 43 students have graduated in math. Due to the infrequent offerings of Math 263 and Math 272, some math students may have transferred without graduating in math. For example, Math 263 did not run for five consecutive fall and spring semesters from Fall 2006 through Fall 2008. It is usually offered in the Spring, and was cancelled in Spring 2007 and Spring 2008. It ran in Spring 2009 with nine students and in Spring 2010 with 22 students. In the Spring 2010 section, 21 of the students were high school students from Masterman who were in a special dual enrollment program.
Although on average only about four people per year graduate in mathematics, the upper level math courses in the curriculum are also taken by students in other disciplines, and are required by several other curricula. These curricula help each other by together providing the needed number of students to run the higher level math courses necessary for all or some of these three curricula. The classes allow up to 36 students.

A background in math is useful for many diverse fields including computer engineering, systems analyst, data communications analyst, urban design, animation, actuarial science, climate analysis, air traffic control, epidemiology, crypto-analysis, forensic analysis, ecology, engineering, physics, and statistics. In the Occupational Outlook Handbook, 2010-11 Edition published by The United States Department of Labor’s Bureau of Labor Statistics, it states that “employment of Mathematicians is expected to increase by 22 percent during the 2008–18 decade, which is much faster than average for all occupations. Advancements in technology usually lead to expanding applications of Mathematics, and more workers with knowledge of Mathematics will be required in the future. However, jobs in industry and government often require advanced knowledge of related scientific disciplines in addition to Mathematics. The most common fields in which Mathematicians study and find work are computer science and software development, physics, engineering, and operations research. Many Mathematicians also are involved in financial analysis and in life sciences research.”

In Pennsylvania, in the years between 2006 and 2016, jobs in professional, technical and scientific services are expected to increase by 37,530 jobs, or 12.3% and have an annual increase of 1.16%.

Three careers for which a background in math is useful are among the 22 “Hot Jobs in Philadelphia” for 2010, and are projected to see double-digit job growth over the next five years.¹ These jobs and their estimated growth rate are:

<table>
<thead>
<tr>
<th>Estimated Percent Growth 2010-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Applications Software Engineers</td>
</tr>
<tr>
<td>Computer Systems Analysts</td>
</tr>
<tr>
<td>Network Systems and Data Communications Analysts</td>
</tr>
</tbody>
</table>

Appendix G shows the regional economic forecast from 2010 to 2018 for jobs that require advanced mathematics.

¹ Source: Economic Modeling Specialists Incorporated; Complete Employment - 1st Quarter 2010; in Hot Jobs in Philadelphia: 2010 Copyright © Philadelphia Workforce Investment Board 2010
VII. Operating Costs and Efficiency

The math program’s operating costs are generally less than College-wide program averages. The cost per credit hour for the math program is consistently less than the College average, as shown in the table below.

Credit Hours Produced and Cost per Credit Hour

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit hours produced</td>
<td>42,590</td>
<td>42,992</td>
<td>45,635</td>
<td>47,124</td>
</tr>
<tr>
<td>Cost per credit hour</td>
<td>$98.56</td>
<td>$107.08</td>
<td>$110.30</td>
<td>$109.53</td>
</tr>
<tr>
<td>College-Wide Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit hours produced</td>
<td>339,439</td>
<td>338,545</td>
<td>348,808</td>
<td>348,969</td>
</tr>
<tr>
<td>Cost per credit hour</td>
<td>$129.79</td>
<td>$137.13</td>
<td>$144.42</td>
<td>$144.65</td>
</tr>
</tbody>
</table>

In the 2007-2008 academic year, the total program cost was $85,971, and the total program cost per FTE was $7,090.38. This total program cost per FTE is slightly lower than the College-wide average, although the program cost per FTE in the previous three years were higher. (This figure is not yet available for the 2008-2009 academic year.) The direct instructional program cost for the Mathematics program for the 2008-2009 fiscal year was $43,309. The direct cost per FTE was $3,383.52, which is also slightly lower than the College average.

Annual Total Program Costs Per FTE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Program</td>
<td>$5,392.50</td>
<td>$5,455.67</td>
<td>$5,858.66</td>
<td>$6,705.51</td>
<td>$7,333.33</td>
<td>$7,090.38</td>
</tr>
<tr>
<td>College-wide Average</td>
<td>$5,393.20</td>
<td>$5,513.54</td>
<td>$5,807.79</td>
<td>$6,666.82</td>
<td>$7,019.64</td>
<td>$7,486.11</td>
</tr>
</tbody>
</table>

Source: Office of Finance and Planning: Table 30

Total Operating, Average Direct and Indirect Costs FY 2007-08 and 2008-2009

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td># FTE</td>
<td>12.125</td>
<td>13.941</td>
<td>12.8</td>
<td>14,207.50</td>
</tr>
<tr>
<td>Total Operating Cost</td>
<td>$85,971</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Direct Instr’l Cost*</td>
<td>$37,757</td>
<td>N/A</td>
<td>$43,309</td>
<td>N/A</td>
</tr>
<tr>
<td>Indirect Cost</td>
<td>$48,214</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Indirect Cost per FTE</td>
<td>$3,976.41</td>
<td>$3,494.94</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Direct Cost per FTE</td>
<td>$3,113.95</td>
<td>$3,494.96</td>
<td>$3,383.52</td>
<td>$3,552.83</td>
</tr>
</tbody>
</table>
* Direct Costs include all expenses associated with the instructional cost centers, including the allocation of fringe benefits.
Source: Office of Finance and Planning: Table 29

The class size for the math degree courses on the main campus in the last 6 semesters is slightly above the average for the College main campus courses for each semester.

### Number of Sections and Average Class Size—Math Curriculum Courses

<table>
<thead>
<tr>
<th></th>
<th>Fall 2006</th>
<th>Fall 2007</th>
<th>Fall 2008</th>
<th>Fall 2009</th>
<th>Spring 2007</th>
<th>Spring 2008</th>
<th>Spring 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Sections</td>
<td>14</td>
<td>13</td>
<td>14</td>
<td>13</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(including Distance Ed.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of Students</td>
<td>331</td>
<td>319</td>
<td>343</td>
<td>372</td>
<td>389</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg. Class Size</td>
<td>25.16</td>
<td>25.5</td>
<td>24.61</td>
<td>29.33</td>
<td>24.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math Curriculum Courses (Main Campus)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>College Main</td>
<td>22.2</td>
<td>22</td>
<td>23.2</td>
<td>23.1</td>
<td>23.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campus Avg. Class Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VIII. Findings and Recommendations**

The goals of the mathematics program support the mission of the College of providing “a coherent foundation for College transfer, employment, and life-long learning.” The core sequence of math courses that make up the program are courses that transfer into the math curriculum of almost all colleges and universities, including Arcadia University, Drexel University, LaSalle University, and Temple University. The two-semester discrete math sequence is a standard course sequence offered at hundreds of colleges and universities. It serves as a gateway course sequence that prepares students for the upper level math courses at baccalaureate institutions in mathematical proofs, logic, set theory, number theory, abstract algebra, combinatorics, graph theory, probability theory, and the mathematics of computer science. The program transfer agreements with Arcadia University, Drexel University, and LaSalle University provide further evidence of the quality of the program.

Although a very small number of students per year graduate in mathematics, the curriculum courses are also taken by students in engineering science, education and computer science, leading to average class sizes of 24-29 students, which is slightly higher than the College average. Program costs are close to the College average. Many of the faculty members teaching courses in the math curriculum are highly qualified, with 14 of 30 full-time faculty having doctorate degrees. Many faculty members teaching these courses have taught comparable courses elsewhere. Many faculty
members have taken courses or workshops in pedagogy. Current students and program graduates cite excellent full-time faculty compared to other community colleges, faculty willingness to work with students outside of class, well-organized high-level courses, and strong interactions between math courses and the Learning Lab as strengths of the program.

Further, students with a solid background in mathematics are very employable in a variety of fields. The mathematics program supports the growing and high-demand careers and initiatives in STEM (Science, Technology, Engineering, and Mathematics). Additionally, math is one of the two fields of study to be selected for the pilot articulation agreements under the new transfer legislation (Act 50) passed on October 9, 2009 which allows Pennsylvania students to apply entire associate degrees toward the graduation requirements of bachelor degree programs at public institutions.

There are certain areas of weakness within the program. Areas for improvement are:

- The extremely small number of students in the program, especially in light of the downward enrollment trend over the last five years
- Gaps in course documentation
- No evidence of assessment activities to assess and share the results of the prerequisite tests that were developed for the math curriculum courses.
- The curriculum committee has not been active for the past year

**Recommendations:**

Although the program’s extremely small enrollment raises questions concerning the need for the program, reasons to continue the program include:

1) The math curriculum courses need to be offered in support of other disciplines at the College, so those courses will be offered whether or not the program exists.
2) The program costs are close to the College average.
3) Career opportunities for individuals with a degree in mathematics are “expected to increase by 22 percent during the 2008–18 decade, which is much faster than average for all occupations.” (Occupational Outlook Handbook, 2010-11 Edition, The United States Department of Labor, Bureau of Labor Statistics)
4) The math curriculum supports the College’s initiative to promote STEM careers.
5) Math is one of two associate-degree curricula selected for the pilot articulation agreements under the new transfer legislation (Act 50) which allows Pennsylvania students to apply entire associate degrees toward the graduation requirements at state-related baccalaureate institutions.

Therefore, it is recommended that the program continue, with the following recommendations:
1. Create an enrollment management plan that addresses program enrollment, recruitment and retention, curricular issues, faculty engagement, tracking of program graduates, and enhancing student support, that will be approved by the Dean by December 2010.

2. Present a follow-up report to the Board of Trustees on implementation of the plan and effects on enrollment by March 2011.

3. Address gaps in course and program documentation
   a) Create an Act 335 course evaluation report for Math 263, as it does not currently exist. (Timeframe: Fall 2010)
   b) Create course documents needed for Math 171 and Math 172, as they do not currently exist. (Timeframe: Fall 2010)

4. Develop and implement a learning outcomes assessment plan that includes:
   a) Development and implementation of assessment tools to determine whether course learning outcomes and mathematics program learning outcomes are being met (Timeframe: April 2011)
   b) Data collection on the results of the prerequisite tests that were developed for a number of courses including Math 163, 171, 172, and 271. (Timeframe: May 2011)

5. Develop and implement an improvement plan for any faculty members who generate large numbers of negative comments and complaints in regards to maintaining a respectful and welcoming classroom environment and/or effective instructional practices. (Timeframe: December 2010)

6. Address issues related to classroom suitability for mathematics instruction through the Dean. (Timeframe: December 2010)

7. Work with the Office of Academic Computing to review software needs of the program and to create a technology plan that addresses future needs and is related to capital budget requests.

8. Determine if Math 263 will be required by the Computer Science program, and if not, develop a plan to increase enrollment in the course. (Timeframe: December 2010)
IX. APPENDICES

Appendix A:

Program revision in order to comply with Technological Competency requirement for 2010-2011 academic year

This form is used to document that the program is in compliance with the technological competency requirement and all other general education requirements for the 2010-2011 academic year.

<table>
<thead>
<tr>
<th>Social Science (3 cr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities (3 cr.)</td>
</tr>
<tr>
<td>Mathematics (3/4 cr.) – at or above MATH 118</td>
</tr>
<tr>
<td>Natural Science (3/4 cr.)</td>
</tr>
<tr>
<td>English 101</td>
</tr>
<tr>
<td>English 102 or 112</td>
</tr>
<tr>
<td>Writing Intensive (3 cr.)</td>
</tr>
<tr>
<td>Interpretive Studies (3 cr.)</td>
</tr>
<tr>
<td>American/Global Diversity (3 cr.)</td>
</tr>
<tr>
<td>Information Literacy (Engl 102)</td>
</tr>
<tr>
<td>Technological Competency (CIS 103)</td>
</tr>
</tbody>
</table>

**Description of Program Compliance**

Program: Associate in Science in Mathematics

Previous Number of Credits Required for Graduation = 63

Number of Credits Required for Graduation with General Education incorporated into the program = 63

Provide a brief explanation of the decision(s) made to comply with the General Education Requirements and complete the following chart. Indicate how your program meets the General Education Requirements. In the last column show which General Education Requirement each course fulfills.

We are replacing a social science elective with CIS 103 in order to comply with the new General Education Requirements.
Appendix B: Mathematics Student Awards Criteria and Award Recipients

Math Department & Thomas Scott Awards

1. The Mathematics Department Award and the Thomas Scott Award are $500 scholarships for study toward the baccalaureate.

2. ELIBIBILITY REQUIREMENTS

For either award candidates must be in their final year of study at Community College of Philadelphia and have demonstrated outstanding competence in Mathematics, and have completed (or will complete) a minimum of Calculus II. Applicants must be of high personal and academic standards and have been accepted to (or applied for acceptance to) a baccalaureate institution for study leading to a degree in Mathematics or a Mathematics-related field.

In addition candidates for the Thomas Scott Award must be graduating students at Community College of Philadelphia whereas applicants for the Math Department Award must have completed at least 36 credit hours at CCP by January 2010.

An individual student may win at most one of the awards.

3. CRITERIA FOR SELECTION

a. Consideration of academic excellence and achievement in terms of the overall grade point average and/or evidence of consistent improvement and currently distinguished performance, especially in Mathematics or Mathematics related course work.

b. Motivation to complete the baccalaureate degree in Mathematics or a field related to Mathematics.

4. APPLICATION PROCESS

a. Applicants must truthfully complete and send or bring the applications to:

   Department of Mathematics
   Community College of Philadelphia
   1700 Spring Garden Street
   Philadelphia, PA  19130

b. Applicants must also personally ask two CCP instructors including at least one Math instructor to submit letters of recommendation on the accompanying form.

c. The application and letters of recommendation are due by February 5, 2010.

d. Applicants must be prepared to answer the following questions if called for an interview with the Awards Committee.

   (1) Which courses have you found most interesting and challenging? Explain.
   (2) Explain what most motivates you to study Mathematics and why. Discuss.
   (3) Describe an experience that influenced your ideas and attitudes while you were a student at CCP.

   (It does not necessarily have to relate to your chosen field of study.)
Math Department Awards
Past award winners and finalists are listed below.

May 2009
Thomas R. Scott Award Linda McLaughlin.
Math Department Award Michael Valle.
Finalists Linda McLaughlin, Michael Valle, Xiaomei Wei.
Committee Jim Diskin, Clark Loveridge, Yun Yoo.

May 2008
Thomas R. Scott Award Gustavo A. Orellana.
Math Department Award Rodriguez N. Tambeck.
Finalists Aissatou Sylla Diallo, Ming D. Guo, Dian Li Jiang, Randolph Alex Muller, Rodriguez N. Tambeck, Gustavo A. Orellana.
Committee Jim Diskin, Clark Loveridge, Yun Yoo.

May 2007
Thomas R. Scott Award Yue Wang.
Math Department Award Mamadou Cisse.
Finalists Mamadou Cisse, Joseph Heard, Alex Sedkov, Yue Wang.
Committee Jim Diskin, Clark Loveridge, Yun Yoo.

2006
Thomas R. Scott Award (given in May) Kyle M. Hofler.
Math Department Award (given in September) Simareesh S. Madan.
Finalists Kyle M. Hofler, Simareesh S. Madan, Tara M. Wagner.
Committee Jim Diskin, Clark Loveridge, Yun Yoo.

May 2005
Thomas R. Scott Award Anh T. Do.
Math Department Award Saumil Patel.
Committee Jim Diskin, Clark Loveridge, Yun Yoo.

May 2004
Thomas R. Scott Award: Wei Sen Zhou ("Bruce").
Math Department Award: Zhenhua Cai ("James").
Finalists: Zhenhua Cai, Hanguang Huang, Hadiyanto Sapruto, Wei Sen Zhou.
Committee: Jim Diskin, Clark Loveridge, Yun Yoo.

May 2003
Thomas R. Scott Award: Sanda Sabrina Shwe.
Math Department Award: Mimi Lian.
Committee: Jim Diskin, Clark Loveridge, Yun Yoo.

May 2002
Thomas R. Scott Award: Si Ah Yoo.
Math Department Award: Phong Nhu Lu.
Finalists: Xue-Xiang Lok, Phong Nhu Lu, Salah Mohamed Osman, Si Ah Yoo.
Committee: Jim Diskin, Ji Gao, Clark Loveridge.

May 2001
Thomas R. Scott Award: Jean Amanda Dorsey.
Math Department Award: Ri Jiang.
Committee: Jim Diskin, Ji Gao, Clark Loveridge.

May 2000
Thomas R. Scott Award: Wing Mei So.
Math Department Award: Yun Yoo.
Finalists: Thuy Hoang Chau, Yang Liu, Arthur S. Sharoyan, Wing Mei So, Dai Ngoc Vu, Yun Yoo.
Committee: Jim Diskin, Ji Gao, Clark Loveridge.

May 1999
Thomas R. Scott Award: Christine A. Keryluk.
Committee: Jim Diskin, Eleanor Strauss.
Appendix C: Mathematics Club and Honor Society Flyer

Come to the next meetings of

**CCP Math Club/CCP Mu Alpha Theta**

from 3:30pm to 5:00pm Fridays in room B1-1

**January 22, 2010:** Practice for Round One of the Rocket City Math Contest.

**January 29, 2010:** Take Round One of the Rocket City Math Contest. All CCP students are welcome to participate.

**February 5, 2010**

*Agenda*

1. Feature presentation by faculty member Sherry Teti on "The Seven Frieze Groups -- Their Display, Algebraic Representations, and Various Characteristics".
2. Introductions.
3. Plan next meetings and events.

**CCP Math Club**

CCP Math Club is a club for CCP students with an interest in Math and science. Activities may include listening to presentations or films, engaging in Math contests, conducting experiments, or visiting science museums. All interested CCP students with a 2.0 overall average are eligible for CCP Math Club membership. CCP Math Club members who have completed either Math 162 or at least one CCP Math course for which Math 162 is a prerequisite may in addition be eligible for membership in CCP Mu Alpha Theta.

**CCP Mu Alpha Theta**
CCP Mu Alpha Theta is part Math club and part Math honor society for select Math and science students at 2-year colleges and high schools. It is part of a national organization with over 1400 chapters. The national organization provides membership cards, newsletters, competitions, regional meetings, and other activities. Membership in CCP Math Club is a prerequisite for membership in CCP Mu Alpha Theta. Full membership in CCP Mu Alpha Theta may be helpful on a student's resume.

Contact
For additional information contact Clark Loveridge
room BR-60, phone (215)751-8689, e-mail cloveridge@ccp.edu.
Appendix D: Mathematics Program Promotional Flyer

Community College of Philadelphia

Do you love Mathematics?
Do you want a career in a Mathematics-related field?
This program may be for you!

Associate Degree in Mathematics

Math 163, 263 Discrete Math I, II
Math 171, 172, 271 Calculus I, II, III
Math 270 Linear Algebra
Math 272 Differential Equations

Transfer Agreements
This curriculum is designed for students who wish to transfer to a Bachelor's program in Mathematics and for other students desiring careers in Math and science. Comprehensive transfer agreements exist with Arcadia University, Drexel University, and LaSalle University.

Dual Degrees
Students who are already taking many of the Math courses listed above as part of a CCP engineering, computer science, or Math education curriculum are encouraged to also enroll in the Math curriculum as a second CCP curriculum.

Program Entry Requirements
If you are ready for Math 171 and English 101 then you can enroll in this program now by going to the counseling office room W2-2 to fill out a change of curriculum form.

If you do not currently meet the entrance requirements but are interested in enrolling in the future, you can still get help in developing an educational plan that will lead to your acceptance into the A.S. Mathematics program. For more information please contact:

- Professor Dan Jacobson, Chair of Mathematics Department: W2-7, (215)751-8792
- Professor Clark Loveridge, Math Curriculum Director: BR-60, (215)751-8689, cloveridge@ccp.edu
- The College Information Center: (215)751-8010
Appendix E: Proposal for Creation of a Mathematics Computer Laboratory: “Mathematics Computation Needs” and Memorandum from Dean of Division of Math, Science and Health Careers

Mathematics Computation Needs
Authors: Atish BAGCHI, Reid HUNTSINGER, Dan JACOBSON, and David SANTOS
December 1, 2006

1. Overview
Mathematics needs its own 'lab' in the same way in which all science departments such as Physics, Chemistry, Biology and Nursing have labs. Such labs are similar in nature, and are administered by the respective departments. In them one can hold demonstrations for faculty or for students, perform experiments, make trial runs of proposed changes, and so on. Examples of such use include, for example, creating platforms to allow students to do some classwork and all homework on a computer, with immediate feedback, as being currently planned by CEMEC, or creating platforms for various testing paradigms, as being currently envisaged by CEMEC and other committees.

The purpose of this proposal is to agilise the needs and resources allocated to the Mathematics Department. These needs are a conglomerate of individual needs of members of the Department, which we present here in a comprehensive and coherent form. As these needs are very specialized and require constant attention, we believe that the current model of dealing with them is inappropriate, as it would burden Academic Computing unnecessarily, to wit:

1. Mathematics sometimes requires software whose support is a more specialized matter than typical computer applications. This makes it inconvenient for IT staff to support and inconvenient for the department when its not available or not working correctly.
2. Such software often makes different requirements on computer resources, e.g. lots of memory. Sometimes even 4 GB is too small.
3. Sometimes Mathematics faculty might wish to develop their own software, and the easy way to have this available to students is to deploy it from a machine under the department’s control.

2. Rationale
Mathematics departments commonly have a departmental computer (or several) which complements the "standard issue" desktops and shared IT infrastructure. The reasons for this are several. First, there’s an 80-20 type rule in IT: 80% of people’s needs are met by 20% of the applications. It makes sense to concentrate IT resources on those. But Mathematics applications (for document preparation, calculation and graphing, data analysis, and symbolic algebra) tend to the opposite extreme. There are many reasons for this, among them that Mathematicians develop many applications themselves. Examples are TeX, for document preparation, and R, for statistical and Mathematical computing and graphing/data display. It is also very common that a particular application, say TeX, to be useful to a certain person, requires certain extensions, of which there are literally thousands. As a consequence, the usual IT support model doesn’t meet an important subset of Mathematicians’ needs, so Mathematics departments meet them by administering one or several computers made available to all.

[Very often these run the Linux operating system, which is free, high-performance (important for many Mathematics packages), low-overhead, secure, very full-featured (TeX is usually standard, for example) and extremely easy to maintain and administer. Much Mathematics software is developed on Linux and therefore the platform with the best support for these applications is Linux. ]
Another reason Mathematics departments often have a departmental computer is that Mathematical computation has a different resource-usage profile than the rest of the computational burden. It tends to be long duration single processes, as opposed to many short duration processes as experienced by a database or web server. Moreover, Mathematics software often requires very large amounts of memory to be available in large contiguous blocks to a single process. As a result the hardware of standard IT isn’t well suited to Mathematical computing. A separate machine, with lots of RAM available to a single process (typically 64 bit in order to increase the possible process address space), is usually the simplest solution. A third reason is that Mathematicians sometimes wish to develop applications to allow their students to use to illustrate concepts from class. Deploying these applications easily and quickly is essential to the cost-benefit calculation: if it takes a few hours to develop a prototype but requires major effort to make deployable and a long time to actually deploy, then it is unlikely that such applications will be developed.

3. Desired Features
At least one computer classroom where all computers have the desired configuration is requested. The configuration can be such that dual booting of both Windows and Linux. Such computer classroom would be of benefit for both students and instructors, since
1. instructors could then configure software for use in their classes into these machines speedily,
2. these classrooms could then be used not only for Mathematics classes, but for various professional development workshops.

3.1 Examples of Specific Software Needed
The following list collates the desires of various faculty. Most of this software comes as standard feature of the Linux operating system, and hence, their procurement will not be difficult.
1. Document Preparation: TeX, Open Office,
2. Symbolic Algebra: Maxima
3. Programming: A perl interpreter, a C++ compiler, a Java compiler
4. Education: AKFQuiz, Fle3,
5. Graphics: Geogebra

3.2 Access: Internal and External
Interested faculty in the Department can be given access to the room where these resources are housed. Willing faculty may also configure the resources to their specific needs without provoking interference to the resources of other faculty. Since, perforce, a student’s time in a resource classroom is limited, it would be ideal if students (and faculty) had access to the resources listed above from a remote (e.g. home) location. Such access can be configured in such a way that no security breaches arise, much in the same way the current Banner system is used by both students and faculty.

4. Security Issues
We need help from IT to discuss possible security issues that may arise and create secure environment in keeping with college policies.

5. Administration-Related Issues
We currently envision having a few interested people charge of the setup, and gradually extend the setup in such a manner that those who are interested in using the lab will learn the necessary information essentially by themselves.

6. Proposed Timeline
Spring 2007: Setting up classroom with machines, downloading of software to be used, demonstrations to faculty (professional development), planning with CEMEC.
Summer 2007: Beginning of online homework in Math 016 and Math 017 with immediate feedback, threshold tests, gateway tests, placement tests implementation, following CEMEC guideline, to be used in continuation of CEMEC pilot programme and in other classes as requested by instructor, and planning professional development workshops devoted to these. Creation of database for these needs. Ongoing updating and refinement.
Thereafter: Dissemination of the model, and further refinement of database. Maintenance of database. Ongoing updating and refinement.

7. Broader Implications
The allocation of the above resources could greatly increase the professional development of the Department, and it could also be a platform for enhancing current online offerings. This last particular issue would be of enormous benefit to the College, since professionally developed faculty would be able to especially tailor their computer needs according to the specific course necessities, without having to burden Academic Computing. It will have the following implications for the students: keeping track of time devoted by students to work, analysis of correlation of time devoted to work and success in class, establishment of the possibility of doing homework online, maintenance of files/programmes/applications for common faculty-use, uniform organization of various other databases related to departmental administration.

8. Estimated Costs
A server-type machine with two 64 bit processors (Intel Xeon or AMD Opteron) in the middle of the speed range, with 8 GB RAM (4 2GB modules) and three hard drives (2 80 GB and 1 250 GB) and a UPS unit comes in just under $5000. I checked Dell (Dell Poweredge 1900 seems to be the right one) and Penguin Computing (who specialize in Linux setups for HPC) and that seems to be market rate. It breaks down like this: basic machine, one processor midrange, 1 GB RAM, 1 80 GB drive $1500-$2000 upgrade to 8 GB RAM $1300- $1500 (I also checked Crucial, a good but low-cost memory supplier and that agrees) disk drives 80 GB $90 250 GB $180 (Dell—we could probably get these cheaper elsewhere) UPS $500-$600 additional processor $300-$500 or so higher speed processors increase cost by $300-$700 or so.
The Mathematics department has proposed the creation of a Mathematics laboratory that will house computers that will have a dedicated server, maintained by the Mathematics department. These computers should be capable of running both Windows and Linux operating systems. This dual functionality will enable the computers to be used for other purposes in addition to the needs of the Mathematics department.

**Rationale**

Mathematics departments in other colleges and universities typically have computer labs that complement the “standard issue” desktops and shared IT infrastructure. This type of structure makes sense from a practical point of view. IT must serve the overall needs of an institution and therefore make decisions that impact the majority of users with limited resources. However, the Mathematics department is proposing that a specialized computer infrastructure that differs from the standard typically used at Community College of Philadelphia be created to allow for specific types of endeavors that can best be performed through the Linux configuration. The Linux operating system, as opposed to a Windows environment, better supports many software applications typically used by Mathematicians (e.g. TeX for document preparation, R for statistical and Mathematical computing and graphing/data display). Consequently, the usual operating system supported by IT does not meet an important subset of Mathematicians’ needs, so Mathematics departments meet them by administering several computers made available to all.

Another reason Mathematics departments often have a departmental computer is that Mathematical computation has a different resource-usage profile from other computational needs. Mathematical computation tends to be long duration single processes, as opposed to many short duration processes, as experienced by a database or web server. Moreover, Mathematics software often requires very large amounts of memory to be available in large contiguous blocks to a single process. As a result the hardware of standard IT isn’t well suited to Mathematical computing. A separate machine, with lots of RAM available to a single process (typically 64 bit in order to increase the possible process address space), is usually the simplest solution.

Finally, Mathematicians sometimes wish to develop applications for their students to use to illustrate concepts from classes. Deploying these applications easily and quickly is essential to the cost-benefit calculation. If it takes a few hours to develop a prototype but requires major effort to make deployable and a long time to actually deploy, then it is unlikely that such applications will be developed. A number of these applications are of the nature purposed by CEMEC.
Potential Benefits Accruing From a Math Lab

The fact that both Linux and TeX are essentially free makes this initiative a very cost effective venture. Some possible outcomes of the creation of a new lab or the use of an existing computer classroom with a server dedicated to a Linux system could be

1. Creation of a Web Site where Faculty could create programs which students could use to facilitate learning.
2. Development of on-line homework programs where students can receive immediate feedback as to their progress in completing the assignment. This would also enable faculty to know how long students are taking on problems and where additional instruction/reinforcement would be needed.
3. Development of workshops that could be offered to high school teachers to facilitate professional development activities.
4. Enable students in upper level Math classes (e.g. MATH 161) to learn to write simple programs to enhance their learning of certain concepts. Reid Huntsinger has already incorporated the use of TeX based programming into MATH 151 and if the software was more readily available to students could also use in MATH 152 and MATH 171.
5. Students could be engaged in research projects either as part of a course or for Departmental Distinction. Student in science areas could also utilize these computers to do research projects involving specific concepts and Mathematical computations.
6. Provide professional development training for Mathematics faculty to teach them how to use TeX to more easily develop homework, problem sets, and other handouts for students.
7. Provide professional development training for faculty in other areas (Music, Foreign Language) to use TeX to more easily develop tests and materials for their specific disciplines.
8. Explore ways to provide services to Corporate Solutions
   a. Actuarial Training on-line (already done by HAAC, Penn, and Temple)
   b. On-line testing programs
9. Development of on-line “refresher” courses for students to take to prepare for Mathematics Placement Tests.
10. Development of Placement Tests that are tailored to fit the needs of CCP students thus eliminating the need for an outside testing service.

Jody Bauer has been consulted regarding this project and has determined that it is doable from a security and infrastructure perspective. I would be happy to discuss this further with you after you have had a chance to review the information in this memo.
Appendix F: Student Surveys: Current Students, Graduates, and Former Students

Community College of Philadelphia
Mathematics Program Survey
Current Students

This survey was mailed and emailed to current, former, and graduated students in the mathematics, engineering, and computer sciences program.

1 current mathematics student returned this survey
7 current engineering students returned this survey
2 current culture science and technology returned this survey
4 current computer science students returned this survey
3 current business students returned this survey
1 current biology student returned this survey
1 dual mathematics and computer science student returned this survey
1 architecture student returned this survey
2 science students returned this survey
2 current students who did not specify their program of study returned this survey

N=25

1. What program are you in at CCP
   1 □ Mathematics
   6 □ Engineering Science
   2 □ Culture Science and Technology
   4 □ Computer Science
   3 □ Business
   1 □ Biology
   1 □ Interior Design
   1 □ Computer Science/Mathematics
   1 □ Architecture
   2 □ Science

2. When did you enter the Mathematics Program?
   • Summer 1 2007
   • Fall 2006
   • Spring 2008
   • Fall 2008
   • Fall 2008
   • Fall 2008
   • Fall 2009
   • Spring 2009
   • Summer 2009
   • 2005
   • Fall 2004
   • Fall 2010
   • Fall 2008
   • Spring 2010
   • Fall 2005
3. **Which of the following reasons were important to you when you initially enrolled in the Mathematics Program at CCP? (Mark all that apply)**

- 12 ☐ To earn an Associate degree
- 22 ☐ To prepare for transfer to a four year college
- 3 ☐ To learn skills needed to enter the job market immediately after CCP
- 1 ☐ To improve my skills for the job that I now have
- 9 ☐ To take courses that interested me.
- ☐ Other (Please explain):
  - Wanted to get the education and the job I deserve

4. **Did you attend another college before attending Community College of Philadelphia?**

- 5 ☐ Yes
- 19 ☐ No

   **If yes how many credits did you transfer into CCP?**

- ☐ 0
- ☐ 0 (from overseas)
- ☐ Over 50

5. **How well is the CCP Mathematics Program preparing you for transferring to another college or obtaining a job in your desired field?**

- 8 ☐ Preparation was excellent
- 12 ☐ Preparation was good
- 4 ☐ Preparation was fair
- 1 ☐ Preparation was not helpful

- CCP math program is so good that I have learnt much in mathematics. Now, I am a tutor in math lab of CCP and help others who have difficulties.
- Some professors offer a better foundation for the students than others. Having the right professor makes all the difference.
- The pace in the class goes too fast for me.
- The mathematics program is exciting and challenging.
- The mathematics program has sharpened my ability to problem solve analyze and to plan ahead for future tasks.
- English 108 and 098 teacher is very strict, a bit too much. Math teacher is very good but it would be even better if he slowed down a little bit but I guess the syllabus is too lengthy.
- I’m taking my first math course now. It looks easier than my Physics 111 course, taking 171 if anything the math courses help with science courses
- Challenging classes. Perfect two week plan 2 week test schedule.
Math 118 [Mr. Parker] was easy, (take home tests) but did not prepare me for 161. 161 with Mr. [blank] was great as was 162 with Mrs. [blank]. Mr. [blank] is very fast but thorough and will give plenty of help after class he makes sure you are prepared for the test.

Some of your teachers are excellent (in the math department). Like Mr. [blank], he knows the material being taught and teaches in a very effective way. On the other hand some instructors (very few) like Mr. [blank] need to learn that being rude and unfriendly and making a student uncomfortable to even ask questions is not a trait of a good teacher.

I have a wrong instructor

6. What do you feel are the strengths of the CCP Mathematics Program?
   - The strengths of the CP math program is their great help provided by the CCP faculties. They are always there no matter who you are.
   - The "selected" outstanding professors.
   - Algebra
   - The teachers
   - Tutoring workshops
   - Some teachers explain in detail
   - As far as I can say, the teacher and the math lab.
   - Mr. [blank], Ms. [blank], Mr. [blank] are great teachers. Mr. [blank] is too easy.
   - Dr. [blank] has no patience and is hard to understand.
   - Its not bad (I should say its good).
   - Professors' knowledge
   - The math tutoring is good
   - The department seems to be similar to that of a four-year college

7. Do you intend to have a dual major with Mathematics?
   - Yes □
   - No □

8. Do you plan to get a degree from CCP?
   - Yes □
   - No □

If yes, when do you expect to graduate?
   - May 2010
   - 2011
   - 2011 Fall
   - 2012
   - Summer 2010
   - Fall 2010
   - Spring 2011
   - After spring 2010
   - December 2010
   - Fall 2010
   - 2011

If no, do you plan to transfer?
   - Yes □
   - No □
9. Are you currently attending CCP
   13 ☐ full-time
   12 ☐ part-time

10. What do you feel needs to be changed or added to the Mathematics Program in order to improve the program?
    Please comment:
    • Math is the only subject that everyone has to face in their lives. No matter what is your major degree, you need math in everywhere. For example: chem., phys, buss., nursing, medical, etc.
    • More solid professors that can help students obtain the foundation needed to continue/further their mathematical knowledge and understanding.
    • Classroom needs to be more interaction with students and instructors. Instructors have to make students participate in classroom by making the student go to the board.
    • Its ok the teachers are relatively good.
    • I can’t really think of anything. My math class is good. Maybe if the teacher slows down it will be better.
    • Could be conscious of other programs. Science majors do not learn the same as design majors
    • Math 118 is too easy, doesn’t prepare students for future courses.
    • More good teachers like Mr. Yoo or Mr. Clee.
    • Your chairperson needs to learn to answer emails
    • More evening and weekend tutors
    • If Calc II is going to be so hard Pre-Calc and Calc I should be better. We are constantly hearing you should have learned this it was in the curriculum
    • The instructor should follow a book which he recommended to his students. He should teach according to the course, Calculus II
    • Professors need to do a better job with explanations and not always rush through stuff

11. Are you satisfied with the instruction you received?
    19 ☐ Yes
    5 ☐ No

12. Were you satisfied with the support you received from the faculty?
    15 ☐ Yes
    3 ☐ No

12a. If yes, please give an example of the type of support you received
    • I have received some of my teachers’ help and they give me idea to go to the math lab and work there. Even other math professors who do not teach certain math level, but still they will help you if you are in different math level
    • Outside of class help, even when not enrolled in some professors, classes.
    • After class instruction
    • My class schedule changed the last minute and I didn't get any notice
    • Extra tutoring during office hours
    • My teacher stays after classes to solve our problems
    • Workshop help
    • Math lab is very helpful and teacher stays after class so we can ask him questions.
    • Extra time with teachers. Mr. Webber, Ms Houbba, and Mr. Diskin.
• Feedback from instructors, with a good attitude.
• The instructor is very willing to help the students
• Helpfulness
• The math tutoring

12b. If no, what type of support were you looking for and did not receive
• To show the interdisciplinary relation with math and other subjects
• One on one support
• There is no feedback

13. What is your current job title and what type of work you do in your primary job?

Job Title: Math lab tutor at CCP and Dunkin Donuts cashier
Describe work: In the math I help other students who have math problems and in the Dunkin Donuts, I take orders online and phone and get their stuffs by the given time. Also, dealing with money.

Job Title: Lab assistant
Describe work: Set up physics lab experiments.

Job Title: Dunkin Donuts Employee-part-time
Describe work: Various things

Job Title: Direct care professional
Describe work: Taking care and monitoring close the behavior of the people I support.

Job Title: Work study at registration center
Describe work: Scanning and indexing documents

Job Title: Supervisor
Describe work: Strive for ways to lower cost and find ways in making the area I am responsible for run more effective.

Job Title: Sales
Describe work: Meet sales quota

Job Title: Bar Porter
Describe work: Help barbacks at nightclubs/bar. Working 10pm-2am

Job Title: Server
Describe work: Food service, cash handling, cleaning

Job Title: WAW Tech
Describe work: Work with AT&T's government sector

Job Title: Direct support personnel
Describe work: Work at group home with individuals with intellectual development disorders

Job Title: Dental Assistant

Job Title: Registered Client Service Associate/Operations Specialist
Describe work: Prepare proposals for investing

Job Title: Signalman
Describe work: Take care for warning system in the railroad division.

14. Do you work in Philadelphia?
   11 □ Yes
   5 □ No

15. Was your enrollment in the Mathematics Program helpful to you in getting this job?
   3 □ Yes
   10 □ No

16. Were you employed in this job prior to enrolling in the Mathematics Program at CCP?
   9 □ Yes
   6 □ No

17. If yes, did your completion of the Mathematics Program at CCP help you do your job better?
   4 □ Yes
   6 □ No

18. How could your Community College of Philadelphia education have been more useful to you in performing your job?
   - It is very helpful because I can get experience and use it outside. My friends tell me that I should start to teach math as a teacher not a tutor. I use my skills in outside in calculation and specially dealing with money in Dunkin Donuts. My manager does not trust anyone except me because I have a good math, so I don not make any mistakes while dealing with money.
   - Not sure at present.
   - I don’t think it could
   - My job is dealing with percentages which I already knew

19. What is your current annual salary?
   9 □ <$20,000
   2 □ $20,000-$25,000
   □ $25,000-$30,000
   2 □ $30,000-$35,000
   3 □ >$35,000

20. How many hours per week on average do you work in this job?
21. **Are you satisfied with your present job?**

- Yes
- No

- Yes I am satisfied because it helps me a lot not in my study but also outside communities.
- It’s work study. I’m trying to survive off of $280 every two weeks. I like the job and people, hours are flexible, but sometimes inconvenient, but it’s a job.
- I’d rather have one that’s related to my major
- Social job
- Its flexible
- Boss are too selfish (it’s the industry)
- I like it very much

22. **If you are not employed now, is this employment status by your choice?**

- Yes
- No

- I’ve tried to find other jobs, but have had no luck for about the past year and a half or so.

**Thank you for your help!** Please return the completed survey by November 30, 2009 in the postage paid envelope enclosed to:

Linda Hansell, Ph.D.
Office of Academic Assessment and Evaluation
Community College of Philadelphia
1700 Spring Garden Street
Philadelphia, Pa. 19130
lhansell@ccp.edu

Please contact Dr. Hansell if you have any questions about this survey.
Community College of Philadelphia  
Mathematics Program Survey  
Graduates  

This survey was mailed and emailed to graduates of the Mathematics, engineering, and computer sciences program.  

4 Mathematics program graduates returned this survey.  N=4  

1. **When did you enter the Mathematics Program?**  
   - Spring 2003  
   - Spring 2000  
   - Spring 2006  

2. **When did you graduate from the Mathematics Program?**  
   - December 2007  
   - Summer Session II  2001  
   - Spring 2008  
   - 2001  

3. **Which of the following reasons were important to you when you initially enrolled in the Mathematics Program at CCP? (Mark all that apply)**  
   4 ☐ To earn an Associate degree  
   4 ☐ To prepare for transfer to a four year college  
   4 ☐ To learn skills needed to enter the job market immediately after CCP  
   4 ☐ To improve my skills for the job that I now have  
   4 ☐ To take courses that interested me.  
   ☐ Other (Please explain):  

4. **Did you accomplish the educational objectives that you set for yourself at Community College of Philadelphia?**  
   1 ☐ Yes, fully  
   2 ☐ Yes, partly  
   1 ☐ No  

Please comment:  
- I was working while in school thus I don’t’ thing I focused on school as much as I should/ could have  
- I received an AA degree for a cheap price and moved on to another school so that was what I stated out to do but I also spent a considerable time trying to get into the dental hygiene program and eventually not getting accepted went on to pursue Math.  I did not intend to spend that much time at CCP, and did not appreciate the sense of ambiguity that exist in acceptance to the health programs  
- All classes I took at CCP were transferred to Drexel University and I had strong Math background when I took classes at CCP.
5. Did you attend another college before attending Community College of Philadelphia?
   □ Yes
   □ No

5a. If yes, how many credits did you transfer into CCP?_______

6. Which of the following describe what you have done since leaving CCP?
   (Mark all that apply)
   4 □ Attended a four-year college full time
   1 □ Attended a four-year college part time
   2 □ Graduated from a four-year college
   1 □ Attended a graduate school
   1 □ Secured full time employment
   □ Secured part time employment

7. Name of most recently attended college:
   ● Philau.edu
   ● SUNY Buffalo
   ● Drexel university

   Date started:
   ● Fall 2008
   ● Fall 2000

   Major:
   ● Finance
   ● Mathematics
   ● Math

   Minor:
   ● Education

8. Present enrollment status at the college listed in Question 7:
   1 □ Still attending full time
   □ Still attending part time
   □ Stopped attending before graduating
   □ Graduated: Degree:
     ● Bachelors,
     ● Masters in Science
   □ Graduation Date
     ● 12/2004
     ● 5/2010
     ● 6/2002, still attending part-time for a PhD in Math.

9. Did your transfer institution accept your CCP Mathematics courses?
   3 □ Yes, all of them
   □ Yes, some of them
   □ None of them
10. Did your transfer institution accept your non-Mathematics CCP courses?
   2 ☐ Yes, all of them
   1 ☐ Yes, some of them
   0 ☐ None of them

11. How well did the CCP Mathematics Program prepare you for the academic demands at the college to which you transferred?
   1 ☐ Preparation was excellent
   0 ☐ Preparation was good
   0 ☐ Preparation was fair
   1 ☐ Preparation was not helpful

Please explain.
- Computer Math/Binary
- CCP was not the best place for me to be at to prepare for a career in Mathematics. The education was too easy and there was a LOT of cheating in Math courses. Teachers used Math questions that circulated around campus and are sold with answers by previous students. My actual knowledge was not developed and challenged at CCP. I got by with high grade but not because I LEARNED a great deal. I found everything harder at my current school because I was ill prepared due to my poor education at CCP.
- I met very educated Math professors at CCP. Even though I transferred to Drexel, they have continued to help me without hesitation to discuss all Math questions.

11a. What factors encouraged you to continue your education?
    Please comment:
    - Hoping to find better career. Improving my overall living experience.
    - It was a no brainer, I come from an educated family and a college degree is the expectation and norm. It is also my deepest desire to become educated and achieve my goals in life. I am accustom to a certain lifestyle and I know I cannot maintain that for myself or future children if I do not have an advance degree.
    - It was very important to pursue a course of study I have a passion for and to be able to turn my education goals into a career that I love.

12. Were you satisfied with the instruction you received?
    2 ☐ Yes
    1 ☐ No

13. Were you satisfied with the support you received from the faculty?
    2 ☐ Yes
    1 ☐ No

14. What do you feel are the strengths of the CCP Mathematics Program?
    - Flexibility with online courses. One day a week, weekend courses.
    - I think it really leaves a lot to be desired.
    - Excellent full-time faculty comparing other community colleges
    - Very well organizing high level courses.
    - Strong interactions between Math courses and tutoring lab
15. **What do you feel needs to be changed or added to the Mathematics Program in order to improve the program?**
   Please comment:
   - The program needs reform. Not necessarily in the courses itself but in the expectations of the students. Students need to have more. Hands on education, education in matlab and Mathematica, computer usage for interpreting Math, homework, testing and better test conditions (arbitrary proctors).
   - Some adjunct faculties need to pursue the teaching profession.

16. **What is your current job title and what type of work you do in your primary job?**
   **Job Title:** Everything! Financial Assistant, Processor ect.
   **Describe work:** Some accounts receivables, processing orders, typing, ordering supplies, managing appraisal statuses, new subcontractor set-ups ect..

   **Job Title:** Sanitation
   **Describe work:** Some Food service/culinary. Mop floor, pick trash, clean pots and pans.

   **Job Title:** Assistant professor at CCP
   **Describe work:** Teaching classes from developmental Math courses to sophomore level courses. Advising students.

17. **Do you work in Philadelphia?**
   2 □ Yes
   1 □ No

18. **Is this job directly related to the field of Mathematics?**
   2 □ Yes
   1 □ No

19. **Was your enrollment in the Mathematics Program helpful to you in getting this job?**
   2 □ Yes
   1 □ No

20. **Were you employed in this job prior to enrolling in the Mathematics Program at CCP?**
   2 □ Yes
   1 □ No
21. If yes, did your completion of the Mathematics Program at CCP help you do your job better?
   2 □ Yes
   □ No

22. What courses or topics could have been added to the Mathematics curriculum that would have been more useful to you in performing your current job?
   • All Math courses which I took at CCP (171, 172, 270, 271, 272, 163, 152, 251)

23. What is your current annual salary?
   1 □ <$20,000
   □ $20,000-$25,000
   1 □ $25,000-$30,000
   □ $30,000-$35,000
   1 □ >$35,000

24. How many hours per week on average do you work in this job?
   • 46
   • 16
   • 30

25. Are you satisfied with your present job?
   1 □ Yes
   2 □ No

   Please comment:
   • I want to work for myself, not anyone else
   • Not what I want to do or went to school for
   • I am very glad that I am a full-time Math faculty at CCP.

26. If you are not employed now, is this employment status by your choice?
   □ Yes
   1 □ No

   • This is not a yes or no answer for me. I want to be employed but must finish my degree (in May 2007) and after plan to go to grad school also the economy is not welcoming to individuals without degrees.
This survey was mailed and emailed to former students in the Mathematics, engineering, and computer sciences program.

1 former Mathematics student returned the survey  N=1

1. When did you enter the Mathematics Program at CCP?
   Semester__________  Year ______________

2. When did you leave the Mathematics Program at CCP?
   Semester__________  Year ______________

3. Which of the following reasons were important to you when you initially enrolled in the Mathematics Program at CCP? (Mark all that apply)
   □ To earn an Associate Degree
   □ To prepare for transfer to a four year college
   □ To learn skills needed to enter the job market immediately after CCP
   □ To improve my skills for the job that I now have
   □ To take courses that interested me.
   □ Other (Please explain):

4. Did you attend another college before attending Community College of Philadelphia?
   □ Yes
   □ No

5. What factors led you to leave the Program before completing it? (Check as many as appropriate)
   □ I learned skills that I wanted to know
   □ Conflict with work schedule
   □ Conflict with family responsibilities
   □ Transferred to another college
   □ Financial reasons
   □ Personal reasons/illness
   □ Academic difficulties
   □ Courses that I needed were not offered when I needed them
   □ Courses were not required at transfer institution
   □ Did not like the Program
   □ No longer interested in the field
   □ Changed my major
   □ Other _____________________
6. Are you still interested in completing the Mathematics Program?
   □ Yes
   □ No

7. Would you have remained in the Program if you had seen one of the following individuals outside of class? (Check as many as appropriate)

<table>
<thead>
<tr>
<th>Staff</th>
<th>Yes</th>
<th>No</th>
<th>Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counselor</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Program Faculty Member</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Program Academic Advisor</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Learning Lab Tutor</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

8. Which of the following describe what you have done since leaving CCP? (Mark all that apply)
   □ Secured full time employment
   □ Secured part time employment
   □ Attended another 2-year college part-time
   □ Attended another 2-year college full-time
   □ Attended a four-year college full time
   □ Attended a four-year college part time
   □ Graduated from a four-year college
   □ Attended a graduate school

9. What do you feel are the strengths of the CCP Mathematics Program?
   Please comment:
   ● Very good department

10. Were you satisfied with the instruction you received?
    □ Yes
    □ No

11. Were you satisfied with the support you received from the faculty?
    □ Yes
    □ No

12. What do you feel needs to be changed or added to the Mathematics Program in order to improve the program?
    Please comment:
    ● More class offerings at night
Appendix G: Economic Forecast for Jobs that Require Advanced Mathematics

Region Info
Region: Phila area
County Areas: Bucks, Pennsylvania (42017), Delaware, Pennsylvania (42045), Montgomery, Pennsylvania (42091), Philadelphia, Pennsylvania (42101)

<table>
<thead>
<tr>
<th>SOC Code</th>
<th>Description</th>
<th>2010 Jobs</th>
<th>2018 Jobs</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-2030</td>
<td>Budget analysts</td>
<td>762</td>
<td>807</td>
<td>45</td>
<td>6%</td>
</tr>
<tr>
<td>13-2050</td>
<td>Financial analysts and advisors</td>
<td>21,240</td>
<td>26,375</td>
<td>5,135</td>
<td>24%</td>
</tr>
<tr>
<td>15-1010</td>
<td>Computer and information scientists, research</td>
<td>734</td>
<td>808</td>
<td>74</td>
<td>10%</td>
</tr>
<tr>
<td>15-1030</td>
<td>Computer software engineers</td>
<td>8,730</td>
<td>10,257</td>
<td>1,527</td>
<td>17%</td>
</tr>
<tr>
<td>15-2010</td>
<td>Actuaries</td>
<td>655</td>
<td>758</td>
<td>103</td>
<td>16%</td>
</tr>
<tr>
<td>15-2020</td>
<td>Mathematicians</td>
<td>17</td>
<td>20</td>
<td>3</td>
<td>18%</td>
</tr>
<tr>
<td>15-2040</td>
<td>Statisticians</td>
<td>644</td>
<td>685</td>
<td>41</td>
<td>6%</td>
</tr>
<tr>
<td>17-2050</td>
<td>Civil engineers</td>
<td>3,626</td>
<td>3,970</td>
<td>344</td>
<td>9%</td>
</tr>
<tr>
<td>17-2060</td>
<td>Computer hardware engineers</td>
<td>539</td>
<td>555</td>
<td>16</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>36,948</strong></td>
<td><strong>44,234</strong></td>
<td><strong>7,286</strong></td>
<td><strong>20%</strong></td>
</tr>
</tbody>
</table>

Source: EMSI Complete Employment - 1st Quarter 2010

Data Sources and Calculations

**Industry Data:** In order to capture a complete picture of industry employment, EMSI basically combines covered employment data from Quarterly Census of Employment and Wages (QCEW) produced by the Department of Labor with total employment data in Regional Economic Information System (REIS) published by the Bureau of Economic Analysis (BEA), augmented with County Business Patterns (CBP) and Nonemployer Statistics (NES) published by the U.S. Census Bureau. Projections are based on the latest available EMSI industry data, 15-year past local trends in each industry, growth rates in statewide and (where available) sub-state area industry projections published by individual state agencies, and (in part) growth rates in national projections from the Bureau of Labor Statistics.

**Occupation Data:** Organizing regional employment information by occupation provides a workforce-oriented view of the regional economy. EMSI's occupation data are based on EMSI's industry data and regional staffing patterns taken from the Occupational Employment Statistics program (U.S. Bureau of Labor Statistics). Wage information is partially derived from the American Community Survey. The occupation-to-program (SOC-to-CIP) crosswalk is based on one from the U.S. Department of Education, with customizations by EMSI.

**State Data Sources:** This report uses state data from the following agencies: Pennsylvania Department of Labor and Industry, Center for Workforce Information and Analysis.